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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/535,680	11/20/2005	Theodore F Morse	BU-086XX	7599
207 7590 07/25/2007 WEINGARTEN, SCHURGIN, GAGNEBIN & LEOVICI LLP TEN POST OFFICE SQUARE BOSTON, MA 02109			EXAMINER VAUGHN, MEGANN E	
			ART UNIT 2859	PAPER NUMBER
			MAIL DATE 07/25/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/535,680

Applicant(s)

MORSE ET AL.

Examiner

Megann E. Vaughn

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 November 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 36-42 is/are allowed.
- 6) ☒ Claim(s) 1-3, 7, 8, 10-14, 16-18 and 22-27 is/are rejected.
- 7) ☒ Claim(s) 4-6, 9, 15, 19-21 and 29-35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 May 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 5/19/2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character **"34" in figure 2** has been used to designate both **cement** and **tip optical fiber**. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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3. Claims 1, 2, 7, 8, 10-14, 16, 17, and 22-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al (US 5381229) in view of Pickrell et al (US 6928202).

Regarding claims 1, 2, 8, 10, 14, 16, 17, and 26-28 Murphy et al discloses in figures 1 and 6, a fiber optic temperature sensor and system for measuring temperatures in a measurement range from less than -200° C to substantially beyond about 1,100° C, comprising an optical fiber being made of a material, specifically sapphire, capable of withstanding temperatures in the measurement range (column 3, lines 58-59; Because the optical fiber comprises sapphire the limitations that the fiber optic temperature sensor for measuring temperature in a measurement range from less than -200C to substantially beyond about 1100C are met); a broadband light source (11) being optically coupled (16) to the optical fiber (14) to transmit light along the optical fiber; an optical spectrum analyzer (18) optically coupled (16) to the optical fiber (14) to receive light reflected back into the optical fiber; and a processor (18 or 38) operative to receive one or more electrical signals from the optical spectrum analyzer representing the intensity of the reflected light across an optical spectrum including an optical wavelength at which an optical characteristic of the fiber sensor is detected, the processor being further operative to determine a value of the optical wavelength at which the optical characteristic of the sensor is detected and to convert the determined wavelength value to a temperature value according to predetermined conversion criteria (column 6, line 22- column 7, line 26).

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Murphy et al does not disclose a rigid sensor body of a heat-dissipating material; a hollow tip member extending from the sensor body, the hollow tip member being made of a material capable of withstanding temperatures in the measurement range; and an optical fiber disposed within the tip member, the optical fiber terminating in a selectively reflective fiber Bragg grating made of materials capable of withstanding temperatures in the measurement range.

Pickrell et al discloses an optical fiber sensor in figure 3, comprising a rigid sensor body of a heat-dissipating material (34); a hollow tip member (32), metal sleeve comprising copper (column 3, lines 35-37) extending from the sensor body, the hollow tip member being made of a material capable of withstanding temperatures in the measurement range; and an optical fiber (20) disposed within the tip member (see figure), the optical fiber terminating in a selectively reflective fiber Bragg grating (46) made of materials capable of withstanding temperatures in the measurement range and having reflectivity which is a function of wavelength of incident light (definition of fiber Bragg grating).

Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to dispose the sapphire optical fiber within the optical fiber sensor structure comprising the metal jacket and fiber Bragg grating, as taught by Pickrell et al, i.e. replace the sensor structure disclosed by Murphy in figure 3, with the sensor structure disclosed by Pickrell in figure 3, in order to protect the optical fiber from harsh environments and provide enhanced sensing capabilities, respectively.

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Regarding claim 7, Pickrell discloses a fiber optic temperature sensor embodiment wherein a tip member can comprises ceramic (column 2, line 64- column 3, line 1). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to comprise a tip member of ceramic as taught by Pickrell because ceramic is a material commonly used in high temperatures and therefore could protect in harsh environments.

Regarding claims 11 and 22, Murphy discloses in figure 1 that the optical fiber is a first optical fiber (14), and further comprising a second optical fiber (13) having one end disposed within the sensor body and optically coupled (23) to the first optical fiber.

Regarding claims 12 and 23, Murphy discloses in figure 1 that the second optical fiber (13) is butt-joined to the first optical fiber (14) with an anti-reflective coating (23) interposed there between (see figure).

Regarding claims 13 and 24, Murphy discloses that the second optical fiber comprises silica (see figure 3; column 3, lines 57-61).

Regarding claim 25, Murphy discloses in figure 1 an optical coupler (16) having one bidirectional optical port coupled to the second optical fiber (13), the optical coupler (16) having a light input optical port (12) coupled to the light source (11) and a light output optical port (17) coupled to the optical spectrum analyzer (18) (see figure).

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4. Claims 3 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy et al (US 5381229) in view of Pickrell et al (US 6928202) as applied to claims 1, 2, 7, 8, 10-13, 16, 17, and 22-25 above, and further in view of Paek et al (US 6233386).

Regarding claims 3 and 18, Murphy and Pickrell discloses the fiber optical temperature sensor and system as stated above in paragraph 3. They do not disclose that the optical fiber comprises zirconia.

Peak et al discloses an optical fiber and fiber Bragg grating comprising zirconia (column 3, lines 25-30). Therefore it would have been obvious for a person having ordinary skill in the art at the time that the invention was made to form the optical fiber disclosed by Murphy and Pickrell comprising zirconia as taught by Peak et al in order to create a more reliable sensor, again, as taught by Peak et al (column 4, lines 44-54).

Allowable Subject Matter

5. Claims 36-42 are allowed.

6. Claims, 4-6, 9, 15, 19-21, and 29-35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

7. The following is an examiner's statement of reasons for allowance:

Claims 4 and 19 are allowable over the prior art of record because the prior art of record does not teach or disclose a fiber optic temperature sensor

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wherein the zirconia is stabilized with yttria, in combination with the remaining limitations of the claims.

Claims 5 and 20 are allowable over the prior art of record because the prior art of record does not teach or disclose a fiber optic temperature sensor wherein the fiber Bragg comprises layers of yttria-stabilized zirconia, different concentrations of grating comprises layers of wherein alternating layers have yttria to provide a desired difference of refractive index, in combination with the remaining limitations of the claims.

Claims 6 and 21 are allowable over the prior art of record because the prior art of record does not teach or disclose a fiber optic temperature sensor wherein the fiber Bragg grating comprises alternating layers of alumina and zirconia, in combination with the remaining limitations of the claims.

Claims 9 and 15 are allowable over the prior art of record because the prior art of record does not teach or disclose a fiber optic temperature sensor wherein the metal sleeve and the tip member of the sensor body are attached together by high-temperature cement, in combination with the remaining limitations of the claims.

Claims 29-33 are allowable over the prior art of record because the prior art of record does not teach or disclose a temperature measuring system wherein the processor is operative when determining the value of the optical wavelength at which the optical characteristic of the fiber Bragg grating is detected to: i) obtain and normalize measured spectrum data from the optical spectrum analyzer when the system is operating at a measurement temperature; and ii)

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compute an amount by which the normalized measured spectrum data must be shifted in wavelength to yield shifted normalized measured spectrum data in which the optical characteristic is most similar to the same optical characteristic in pre-established reference spectrum data, in combination with the remaining limitations of the claims.

Claims 34-35 are allowable over the prior art of record because the prior art of record does not teach or disclose a temperature measuring system wherein the predetermined conversion criteria comprises a multiplicative factor representing a temperature difference per unit of shift, in combination with the remaining limitations of the claims.

Claims 36-42 are allowable over the prior art of record because the prior art of record does not teach or disclose a temperature measurement system employing a fiber optic temperature sensor and an optical spectrum analyzer optically coupled to the temperature sensor, wherein the temperature sensor produces reflected light across an optical spectrum including an optical wavelength at which an optical characteristic of the temperature sensor can be detected, and wherein the optical spectrum analyzer is operative to produce electrical signals representing the intensity of the reflected light from the temperature sensor across the optical spectrum, a method of generating a measured temperature value based on the electrical signals, comprising computing an amount by which the normalized measured spectrum data must be shifted in wavelength to yield shifted normalized measured spectrum data in which the optical characteristic is most similar to the same optical characteristic

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in the reference spectrum data, in combination with the remaining limitations of the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Chang et al (US 6396572).


9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megann E. Vaughn whose telephone number is 571-272-8927. The examiner can normally be reached on 8 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MEV
Patent Examiner Art Unit 2859
7/23/2007



Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800